

Females were seen at our study sites only a few times. On 4 April 1981 two mating pairs of *M. spinetorum* were found on North Peak. Both were on trees frequently used by perching males. One pair was resting on juniper foliage, the other on a staminate cone of digger pine. Occasional North Peak females were seen flying about pine dwarf mistletoe on a ridgetop near the summit. Although no mating *M. johnsoni* were found at Butts Canyon, several ovipositing females were observed on the ridgetop in April. The disproportionate sex ratio at the ridgetops and summit may indicate female dispersal after mating.¹

These observations are consistent with Shields' (1967, J. Res. Lepid. 6:69-178) and Scott's (1970, J. Res. Lepid. 7:191-204) conclusions that butterflies with low population densities hilltop in order to facilitate the rendezvous of mates.

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RICHARD V. KELSON, 29 Tiffin Ct., Clayton, California 94517 AND MARC C. MINNO, Aquatic Plant Management Laboratory, 3205 SW 70th Avenue, Fort Lauderdale, Florida 33314.

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LEPIDOPTERA REARED ON A SIMPLE WHEAT GERM DIET

Artificial diets have been used as food in rearing many species of Lepidoptera (Singh, 1972, Bull. N.Z. Dept. Scient. Ind. Res. 209 pp.; Vanderzant, 1974, A. Rev. Entomol. 19: 139-160; Hinks & Byers, 1976, Can. Entomol. 108:1345-1357). They may be synthetic (meridic), or composed of one or more natural products (oligidic) such as wheat germ and homogenized beans. The latter type is especially useful in rearing the larvae of polyphagous species of Lepidoptera, since no specific phagostimulants are required.

Fifty-seven species of Lepidoptera, mainly Noctuidae but also Lymantridae and Geometridae (Table 1), were reared from egg to adult on a simple wheat germ diet from 1977-1980. Adult females were collected at either a 15 watt ultraviolet light or sugar bait. Females thus collected were placed in 10 × 6 × 2 cm clear polystyrene boxes and fed a 10-15% sucrose solution until eggs were laid.

Larvae of all species were fed an artificial diet based on that of Hinks and Byers (1976), except that kidney beans were used instead of pea beans. An additional 100 g of wheat germ and 12 ml of formaldehyde were also used. The formaldehyde had no effect on the growth of any species of Lepidoptera bred, although it is known to have an inhibitory effect on the growth of other kinds of insects (Singh & House, 1970, J. Insect Physiol. 16:1969-1982).

Rearing techniques followed those developed by Hinks and Byers (1976) for the genus *Euxoa*, except that larvae were reared in 10 × 6 × 2 cm clear polystyrene boxes, with 15-20 larvae/box. At the fourth instar the larvae were separated and reared to maturity individually in 15 × 100 mm disposable polystyrene Petri dishes. All larvae were reared at 25-30°C under a photoperiod of 15-9 h light-dark cycle.

Feeding was discontinued at the first visible signs of the prepupal period, and 5-10 larvae were placed in 946 ml polystyrene containers partially filled with moist, sterilized top soil. A strip of paper towel provided a vertical surface for the moths to crawl up upon emergence. The containers were sealed with clear polyethylene and were kept at the same temperature and photoperiod conditions as the larvae.

Newly eclosed larvae of two noctuid species, *Feralia comstocki* Grt., a general feeder on coniferous trees, and *Homorthodes furfurata* (Grt.) which has been recorded from *Acer* spp. (Rockburne & Lafontaine, 1976, The Cutworm Moths of Ontario and Quebec.

TABLE 1. Lepidoptera reared on artificial wheat germ diet.

Family	Species	Larval foodplant
Geometridae	<i>Melanophia canadaria</i> (Wlk.)	General feeder
	<i>Pero morrisonaria</i> (Hy. Edw.)	General feeder
Lymantriidae	<i>Orgyia leucostigma plagiata</i> (Wlk.)	General feeder
	<i>Orgyia leucostigma sablensis</i> Neil	General feeder
Noctuidae	<i>Zale minerea</i> (Gn.)	General feeder on deciduous trees
	<i>Autographa flagellum</i> (Wlk.)	<i>Helianthis, Liatris</i> ¹
	<i>Plusia putnami</i> Grt.	Grasses
	<i>Acronicta innotata</i> Gn.	General feeder on deciduous trees
	<i>Acronicta noctivaga</i> Gn.	General feeder on deciduous trees
	<i>Crymodes devastator</i> (Brace)	Grasses
	<i>Phlagophora iris</i> Gn.	General feeder
	<i>Elaphria festivooides</i> (Gn.)	General feeder on deciduous trees
	<i>Xylena curvimacula</i> (Morr.)	General feeder
	<i>Lithophane innominata</i> (Sm.)	General feeder on deciduous trees
	<i>Eupsilia vinulenta</i> (Grt.)	General feeder
	<i>Eupsilia tristigmata</i> (Grt.)	General feeder
	<i>Eupsilia morrisoni</i> (Grt.)	General feeder
	<i>Siderides maryx</i> (Gn.)	_____
	<i>Polia imbrifera</i> (Gn.)	General feeder on deciduous trees
	<i>Polia latex</i> (Gn.)	General feeder on deciduous trees
	<i>Melanchra adjuncta</i> (Gn.)	General feeder
	<i>Melanchra assimilis</i> (Morr.)	General feeder
	<i>Lacanobia atlantica</i> (Grt.)	General feeder on low plants
	<i>Lacanobia grandis</i> (Gn.)	General feeder
	<i>Lacanobia lutra</i> (Gn.)	General feeder
	<i>Lacanobia legitima</i> (Grt.)	Grasses, general feeder on low plants
	<i>Lacanobia lilacina</i> (Harv.)	Grasses, general feeder on low plants
	<i>Lacinipolia renigera</i> (Steph.)	General feeder
	<i>Lacinipolia lorea</i> (Gn.)	General feeder
	<i>Lacinipolia olivacea</i> (Morr.)	General feeder on low plants
	<i>Pseudaletia unipuncta</i> (Haw.)	Grasses, general feeder
	<i>Leucania inermis</i> (Fbs.)	Grasses
	<i>Crocigrapha normani</i> (Grt.)	General feeder on deciduous trees
	<i>Orthosia revicta</i> (Morr.)	General feeder on deciduous trees
	<i>Orthosia hibisci</i> (Grt.)	General feeder on deciduous trees
	<i>Homorthodes furfurata</i> (Grt.)	<i>Acer</i> spp. ²
<i>Pseudorthodes vecors</i> (Gn.)	General feeder on low plants	
<i>Tricholita signata</i> (Wlk.)	Feeds in stems and flowers of various Compositae	
<i>Agrotis volubilis</i> Harv.	<i>Achillea millefolium</i> L., <i>Vaccinium vacillans</i> Torr. <i>Oenothera biennis</i> L. ⁴	
<i>Agrotis ipsilon</i> (Hufn.)	General feeder	
<i>Feltia heralis</i> (Grt.)	General feeder	
<i>Euxoa divergens</i> (Wlk.)	_____	
<i>Euxoa scandens</i> (Riley)	General feeder	
<i>Euxoa tristicula</i> (Morr.)	_____	
<i>Euxoa perpolita</i> (Morr.)	_____	
<i>Ochropleura plecta</i> (L.)	General feeder on low plants	

TABLE 1. Continued.

Family	Species	Larval foodplant
	<i>Peridroma saucia</i> (Hbn.)	General feeder
	<i>Diarsia jucunda</i> (Wlk.)	Grasses
	<i>Eurois astricta</i> Morr.	General feeder on woody plants
	<i>Xestia dolosa</i> Franc.	General feeder
	<i>Xestia normaniana</i> (Grt.)	General feeder
	<i>Xestia smithii</i> (Snell.)	General feeder
	<i>Xestia oblata</i> (Grt.)	General feeder on low plants
	<i>Metalepsis fishii</i> (Grt.)	<i>Vaccinium</i> ^{2,3}
	<i>Anaplectoides prasina</i> (D. & S.)	General feeder on low plants
	<i>Eueretagrotis perattenta</i> (Grt.)	General feeder

¹Tietz, 1972, An Index to the Described Life Histories, Early Stages and Hosts of the Macrolepidoptera of the Continental United States & Canada. 11, A. C. Allyn, Sarasota, 1041 pp.

²Rockburne & Lafontaine (1976).

³Ferguson, 1975, U.S. Dept. Agric. Tech. Bull. 1521, 49 pp.

⁴McCabe, 1981, J.N.Y. Entomol. Soc. 89(2): 59-64.

Can. Dept. Agric. Publ. 1593. 164 pp., 613 figs.) refused to eat the artificial diet. Both species were subsequently reared on previously recorded host plants.

KENNETH NEIL, *Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, CANADA V5A 1S6.*

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EGG PLACEMENT BY *PHOEBIS* (PIERIDAE) ON *CASSIA* (LEGUMINOSAE) "ANTICIPATES" THE TROPICAL RAINY SEASON

As the tropical dry season advances, one common response by green plants is a progressive loss of leaves, which is sometimes accompanied by a gradual development of new leaf buds near the end of this period (Janzen, 1967, *Evolution* 21:620-637). By the time the rainy season is underway, such a plant species exhibits considerable leafing-out, providing herbivorous insects with an expanded food base. At any given Central American locality, not all plant species respond to the same degree to the dry season.

At "Finca La Tigra" on the Atlantic slope (220 m elev.) of Costa Rica's Cordillera Central (near La Virgen, Heredia Province, 10°23'N, 84°07'W) the plant family Leguminosae exhibits a broad range of dry season response patterns during the longer of two dry periods characteristic of this Premontane Tropical Wet Forest locality (Fig. 1). Many legume genera remain fully leaved throughout the major dry season, although the production of new leaf buds is often low. Others remain evergreen and exhibit considerable leaf replacement at this time. Still others, such as the roadside shrub or small tree (canopy height 2-5 m), *Cassia fruticosa* Mill., exhibit considerable loss of mature leaves, followed by a gradual development of new leaf buds in the latter part of the major dry period, which usually extends from late December through March. This is also a period of greatly reduced flowering and complete absence of fruits on *C. fruticosa* (Allen M. Young, unpubl. data, 1973-1982). The guild or assemblage of herbivorous insects associated with this tree species must cope physiologically and behaviorally with this annual cycle of seasonal changes in the availability of various edible plant parts.